Issued November 4, 1907.

United States Department of Agriculture,

BUREAU OF CHEMISTRY,

H. W. WILEY, Chief of Bureau.

EXPERIMENTAL WORK WITH PURE YEAST CULTURES IN DETERMINING THE CHEMICAL CHARACTER OF THE FERMENTED PRODUCTS.

The Bureau of Chemistry has for several years conducted preliminary investigations on the use of pure yeast cultures in the fermenting of ciders and has already published Bulletins Nos. 71 and 88[1] relating to this subject. Samples of yeasts have also been furnished from the Enological Laboratory to persons who cared to experiment with them. The results both of the experiments made by the Bureau and by private individuals have been promising, and one or more cultures will now be furnished to persons or firms who wish to experiment with them, together with simple instructions for their use, provided that the applicant will agree to report the result obtained. A technical report is not demanded, but a definite statement of the character of the material fermented and the result obtained, as compared with the result of the procedure commonly followed.

The following list of yeasts have been selected from the collection made in the previous experiments and are of known value:

Nos. 8, 37, 66, and 73, for apple cider.

Nos. 46, 59, 161, and 162, for red fermented fruit juices.

Nos. 47 and 61, for sparkling fermented beverages.

Nos. 53 and 73, for white fermented fruit juices.

In making application for yeasts designate them by number and state the use for which they are intended, so that suggestions may be made and substitutions offered if the stock of any yeast be exhausted. Applications should reach the laboratory about ten days before the yeast is needed, and be addressed to—WM. B. ALWOOD, In Charge, ENOLOGICAL INVESTIGATIONS, CHARLOTTESVILLE, VA.

H. W. WILEY,
Chief, Bureau of Chemistry.

WASHINGTON, D. C., *October 15, 1907.*

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[1] Bul. No. 71. A Study of Cider Making in France, Germany, and England, with Comments and Comparisons on American Work. By Wm. B. Alwood, Special Agent, 1903. Bul. No. 88. The Chemical Composition of Apples and Cider. I. The Composition of Apples in Relation to Cider and Vinegar Production. II. The Composition of Cider as Determined by Dominant Fermentation with Pure Yeasts. By Wm. B. Alwood, R. J. Davidson, and Wm. A. P. Moncure, Virginia Agricultural Experiment Station. 1904. These may be obtained from the Superintendent of Documents, Washington, D. C.; price 20 and 5 cents, respectively.

DIRECTIONS FOR THE USE OF PURE YEAST CULTURES.

The vials sent out by the Bureau of Chemistry contain a strong culture of pure yeast, and should be handled as follows:

Before uncorking the vial, cool it carefully with ice to avoid loss of yeast by effervescence when the cork is removed. The yeast in one vial is sufficient to inoculate one cask of 50 gallons of must if used within fifteen days from the date given on the label; but if a larger amount is to be used, proceed as follows:

Prepare two gallons of fresh apple or grape juice by first bringing the same to the boiling point, then pour it into a clean wooden vessel and at once cover with a cloth wrung from boiling water. Put this vessel in a warm place where the temperature will not fall below 75° F., and when the juice has a temperature of about 85° or 90° F., empty the contents of a vial into it and let it stand covered for two or three days, at which time it should be in strong fermentation. It is then ready for use. One pint of this culture is sufficient to inoculate 50 gallons of must. Stir well before using.

The juice or must intended for the experiment should be freshly pressed, placed in a perfectly clean barrel or cask, and the yeast culture described above poured into it at once. Do not fill the cask quite full of must, but leave from four to five inches of space beneath the bung, so that there shall be no overflow of foam. Close the bung with clean cotton and keep it closed, but be careful to prevent the cotton from becoming moist, as this will greatly favor the entrance of malferments, especially the acetic ferments. A properly made cotton plug if kept dry strains the germs out of any air which may enter the cask, and readily permits the escape of gases. For special devices see Bulletin No. 71 of the Bureau of Chemistry. In the case of red fermented grape juice, the yeast cultures must be stirred into the pulped grapes at once, and it is better to use double or treble the quantity recommended for the expressed must.

The first or tumultuous fermentation will be completed in from three to ten days, according to the temperature of the room; 75° to 80° F. is a favorable temperature. At the subsidence of this first fermentation draw the liquor, separating it as perfectly as possible from the dregs, and place it in a perfectly clean cask for the second fermentation. This cask should stand in a room where the temperature will be fairly constant at 55° to 60° F., and should be bunged again with cotton so as to permit the escape of gas and prevent the entrance of all undesirable organisms.

The time required for second fermentation will depend upon whether apple or grape must is being fermented and also upon the richness of the juice. For ordinary apple cider, following the procedure outlined, fermentation should be completed in the course of eight or ten weeks, or at most three months, and the liquor should then be bottled if dry

sparkling cider is desired. Cider made from must which shows a specific gravity before fermentation of 1.050 or higher can be fermented to 1.003 or 1.002 and will still develop sufficient gas in the bottle for a bright effervescing cider.

The subject of the secondary fermentation of fruit juices can not be discussed in this brief circular. The successful use of the pure cultures depends wholly upon mixing them promptly with the expressed must or pulped fruit. Moreover, it is useless to add pure yeast cultures to poor thin musts or to musts derived from partly decayed and unclean fruit.

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